

DPP-03

SOLUTIONS

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1. With the condition, $c^2 = 4d$, the equation $x^2 - cx + d = 0$ has equal roots.

Each root $= \frac{c}{2}$.

As $\frac{c}{2}$ is a root of $x^2 - ax + b = 0$

$$\therefore \frac{c^2}{4} - a \cdot \left(\frac{c}{2}\right) + b = 0$$

$$\Rightarrow \frac{4d}{4} - \frac{ac}{2} + b = 0 \Rightarrow b + d = \frac{ac}{2}$$

$$\Rightarrow 2(b + d) = ac.$$

2. Let $a, 4a$ be the of the equations,

Since, $x^2 - x + 3m = 0$ and $x^2 - x + m = 0$

Therefore, $16a^2 - 4a + 3m = 0$.

using (4a) $a^2 - a + m = 0$

using (a) (1) $-3 \times (2)$ gives,

$$13a^2 - a = 0$$

$$\Rightarrow a = \frac{1}{13}$$

From (2)

$$\left(\frac{1}{13}\right)^2 - \frac{1}{13} + m = 0$$

$$m = \frac{13-1}{13^2}$$

$$\therefore m = \frac{12}{169}$$

3. $ax^2 + bx + c = 0, 2x^2 + 7x + 10 = 0$

$$\frac{a}{2} = \frac{b}{7} = \frac{c}{10} = k$$

$$a = 2k, b = 7k, c = 10k$$

$$\frac{2a+c}{b} = \frac{4k+10k}{7k} = \frac{14k}{7k} = 2$$

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4. $x^2 + ax + b$

Now, $P(P(P(x))) = 0$

$\Rightarrow P(P(x)) = a \text{ or } b$

$\Rightarrow P(x) = a_1 a_2 \text{ or } b_1 b_2$

$\Rightarrow x = a_{11} a_{12} a_{21} a_{22} \text{ or } b_{11} b_{12} b_{21} b_{22}$

If $a = 0$

$\Rightarrow P(P(x)) = 0$

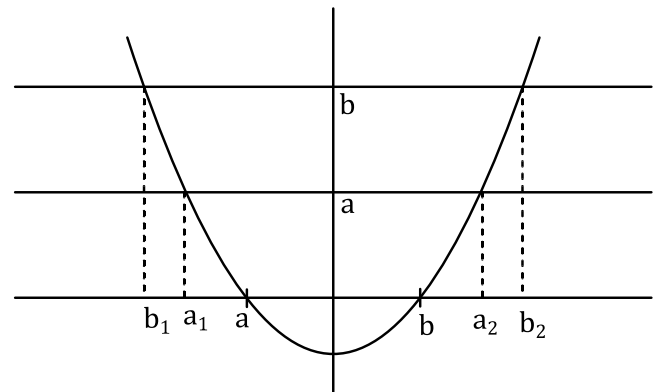
$\Rightarrow P(x) = 0b \text{ or } b_1 b_2$

$\Rightarrow x = 0b a_{21} a_{22} \text{ or } b_{11} b_{12} b_{21} b_{22}$

$\therefore$ For having common roots one value have to be 0.

$\therefore$ i.e. $P(0) \cdot P(1) = 0$

option C is correct



5. Given, $x^3 + x^2 - 4x = 4$... (i)

$x^2 + px + 2p = 0$... (ii)

Have two roots common To find value of P.

From eq(i), $\alpha + \beta + \gamma = -1$

$\alpha\beta + \beta\gamma + Y\alpha = -4$

$\alpha\beta Y = 4$

From eq(ii),

$\alpha + \beta = -p, \alpha\beta = 2p$

Putting value of $\alpha + \beta$,

$-p + \gamma = -1$

$\therefore \gamma = -1 + p$

$\therefore \alpha\beta\gamma = 4 \therefore 2p\gamma = 4$

$\therefore p(-1 + p) = 2$

$\Rightarrow -p + p^2 - 2 = 0$

$\therefore p = \frac{1 \pm \sqrt{1+8}}{2} \Rightarrow \frac{1 \pm 3}{2}$

$\therefore p = \frac{4}{2} = 2, p = \frac{-2}{2} = -1$

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6. $x^2 + px + 10 = 0$

$$\alpha^2 + p\alpha + 10 = 0 \quad \dots(1)$$

$$x^2 + qx + 8 = 0$$

$$\alpha^2 + q\alpha + 8 = 0 \quad \dots(2)$$

$$x^2 + (2p + 3q)x + 60 = 0$$

$$\alpha^2 + (2p + 3q)\alpha + 60 = 0 \quad \dots(3)$$

$$(1) - (2)$$

$$(p - q)\alpha = -2 \quad \dots(4)$$

$$(2) - (3)$$

$$(p + q)\alpha = -26 \quad \dots(5)$$

$$(4) \div (5)$$

$$\frac{p-q}{p+q} = \frac{1}{13}$$

$$\Rightarrow \frac{p-q-p-q}{p-q+p+q} = \frac{1-13}{1+13} = \frac{-6}{7}$$

$$\Rightarrow \frac{q}{p} = \frac{6}{7}$$

$$\Rightarrow q = \pm 6, p = \pm 7$$

$$p - q = 7 - 6 = 1$$

$$p - q = -7 + 6 = -1$$

7. We have

$2x^2 - 3x + 5 = 0$ on comparing that and we get

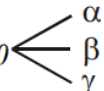
$$ax^2 - bx + c = 0$$

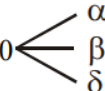
$$a = 2, b = 3, c = 5$$

Then

$$a + b + c = 2 + 3 + 5 = 10$$

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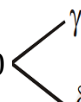
8. We have, $x^3 + 4x^2 + px + q = 0$  (i)

$x^3 + 6x^2 + px + r = 0$  (ii)

(Subtract)

$2x^2 + (r - q) = 0$ 

So, $\alpha + \beta = 0 \Rightarrow \gamma = -4$ and $\delta = -6$.

As, $x^2 + 2ax + 8c = 0$ 

So, $\gamma + \delta = -2a \Rightarrow a = 5$; $\gamma\delta = 8c \Rightarrow c = 3$

Also, $\frac{\alpha\beta\gamma}{\alpha\beta\delta} = \frac{-q}{-r} \Rightarrow \frac{2}{3} = \frac{q}{r} \Rightarrow 3q = 2r$

9. $x^3 + ax^2 + bx + 1 = (x^2 + 3x + 5) \left(x + \frac{1}{5}\right) + \left(a - 3 - \frac{1}{5}\right)x^2 + \left(b - 5 - \frac{3}{5}\right)x$

$a - 3 - \frac{1}{5} = 0$

$b - 5 - \frac{3}{5} = 0$

$a = \frac{16}{5}$

$b = \frac{28}{5}$

$[a + b] = \left[\frac{44}{5}\right] = 8$